

**PSP Cover Sheet** (Attach to the front of each proposal)

Evaluation of Contaminant Effects of Priority Fish Food-Chain  
Resources in the Sacramento-San Joaquin River and the Bay-Delta  
Estuary and Development of Pesticide Monitoring Guidelines

Proposal Title: \_\_\_\_\_  
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Amount of funding requested: \$ 2,495,770.00 for 3 years

Indicate the Topic for which you are applying (check only one box).

- |  |   |
|--|---|
| <input type="checkbox"/> Fish Passage/Fish Screens   | <input type="checkbox"/> Introduced Species       |
| <input type="checkbox"/> Habitat Restoration         | <input type="checkbox"/> Fish Management/Hatchery |
| <input type="checkbox"/> Local Watershed Stewardship | <input type="checkbox"/> Environmental Education  |
| <input checked="" type="checkbox"/> Water Quality    |   |

Does the proposal address a specified Focused Action? ☒ yes ☐ no \*2 of them

What county or counties is the project located in? Contra Costa County

Indicate the geographic area of your proposal (check only one box):

- |   |   |
|---|---|
| <input type="checkbox"/> Sacramento River Mainstem  | <input type="checkbox"/> East Side Trib: _____                  |
| <input type="checkbox"/> Sacramento Trib: _____     | <input type="checkbox"/> Suisun Marsh and Bay                   |
| <input type="checkbox"/> San Joaquin River Mainstem | <input type="checkbox"/> North Bay/South Bay: _____             |
| <input type="checkbox"/> San Joaquin Trib: _____    | <input type="checkbox"/> Landscape (entire Bay-Delta watershed) |
| <input checked="" type="checkbox"/> Delta: _____    | <input type="checkbox"/> Other: _____                           |

Indicate the primary species which the proposal addresses (check all that apply):

- |  |   |
|--|---|
| <input type="checkbox"/> San Joaquin and East-side Delta tributaries fall-run chinook salmon | <input checked="" type="checkbox"/> Spring-run chinook salmon |
| <input type="checkbox"/> Winter-run chinook salmon   | <input checked="" type="checkbox"/> Fall-run chinook salmon   |
| <input type="checkbox"/> Late-fall run chinook salmon  | <input type="checkbox"/> Longfin smelt                        |
| <input checked="" type="checkbox"/> Delta smelt  | <input type="checkbox"/> Steelhead trout                      |
| <input type="checkbox"/> Splittail   | <input type="checkbox"/> Striped bass                         |
| <input type="checkbox"/> Green sturgeon  | <input type="checkbox"/> All chinook species                  |
| <input type="checkbox"/> Migratory birds   | <input type="checkbox"/> All anadromous salmonids             |
| <input type="checkbox"/> Other: _____  |   |

Specify the ERP strategic objective and target (s) that the project addresses. Include page numbers from January 1999 version of ERP Volume I and II:

Strategic Plan Goal 1, Objective 1 (ERP Vol. 2, pg 194) target, (Vol. 2, pg 20)  
Strategic Plan Goal 1, Objective 3 (ERP Vol. 1, pg 220) target, (Vol. 2, pg 26)  
Strategic Plan Goal 1, Objective 5 (ERP Vol. 1, pg 222) target, (Vol. 2, pg 28)  
Strategic Plan Goal 6, Objective 2,3 (ERP Vol. 1, pg 506) target, (Vol. 2, pg 113)

**Evaluation of Contaminant Effects on Priority Fish Food-Chain Resources  
in the Sacramento-San Joaquin River and the Bay-Delta, Estuary  
and Development of Pesticide Monitoring Guidelines**

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Type of Organization/Tax Status:

501(c)(3) Non-profit Research Institute  
Tax ID #94-295137

## EXECUTIVE SUMMARY

Overview. This proposal addresses two CALFED water quality focused actions for the Sacramento River, San Joaquin River, and the Delta: 1) to perform toxicity testing, identify toxic agents in toxic samples (e.g., Toxicity Identification Evaluations), and develop toxicity testing methods using Delta species; and, 2) to develop a monitoring strategy to estimate pesticide use by watershed, both as reported to Department of Pesticide Regulation and unreported use. While those two focused actions contain distinct components, both will be efficiently addressed in an integrated study that focuses on the identification of which contaminants, including pesticides, are most likely to be impacting chinook salmon and another important fish species, probably delta smelt. Direct impacts to fish life stages and to their resident prey species will be studied. The proposed study uses an adaptive approach beginning with extensive review and analysis of existing data, followed by laboratory studies filling specific toxicological data gaps, development of pesticide measurement methods, and a set of field studies to verify laboratory results and to demonstrate any contaminant impacts. The main products of this study will be an assessment of the potential for contaminant effects on salmon and delta smelt and a set of guidelines for future pesticide monitoring. This project will be conducted by an outstanding multidisciplinary team of scientists advised by an external Project Advisory Committee composed of CALFED, agency, and stakeholder representatives, and other appropriate scientists.

Background. Modifications of the Sacramento and San Joaquin Rivers and the Bay-Delta estuary along with less noticeable changes in the chemical composition of surface waters, are believed to be responsible for documented declines in the region's historically diverse and abundant aquatic species. A critical function of the Bay-Delta ecosystem is the link it provides between spawning and feeding grounds for chinook salmon, and as habitat for delta smelt, both federally listed species. Those fish require adequate Delta water quality for their growth, reproduction and development and to support their invertebrate prey populations.

Over the past 10 years, Delta waters have frequently exhibited acute toxicity to sensitive, non-resident aquatic invertebrates. At the same time, numerous studies have shown declines in resident invertebrate populations, coinciding with increased use of these pesticides throughout the watershed, abandoned mine waste discharges, and increased contamination from stormwater runoff. However, no comprehensive studies have been conducted to investigate the relationships between increased contamination, fish and resident prey species declines.

Proposed Project. This study addresses aspects of CALFED Ecosystem Restoration Program Goal 1, Restoration of Threatened and Endangered Species, and Goal 6, Aquatic Toxicity. Contamination has been identified as a probable stressor that could affect the restoration of spring and fall run chinook salmon and delta smelt, and is the focus of the proposed study.

The proposed study has two objectives:

- 1) Assess the potential for contaminant effects (including pesticides) on spring and fall run chinook salmon and another important resident fish (probably delta smelt), and on the resident invertebrates that are major prey for the life stages of those fish.
- 2) Identify and prioritize potentially problematic pesticides and develop guidelines for future monitoring of pesticides and subsequent interpretation of the monitoring data.

The proposed project will be conducted in four Phases, each consisting of several Tasks, over a three year period. Each phase will use information gained from the preceding Tasks in an adaptive fashion. Therefore, it is not possible to detail all of the work that will be done at this time, particularly in the last two Phases.

**Phase I** includes a single Task, a comprehensive review of existing information about fish diets, contaminant concentrations, and toxicity to fish and their prey that will result in a report that summarizes and synthesizes that information and identifies critical data gaps.

**Phase II** includes four Tasks that compose a series of studies to fill data gaps. Toxicity testing of unknown pesticides a National Marine Fisheries Service study of salmon diets and tissue contamination will be completed, and sampling and analyses of sediment contamination in the Delta will be conducted to provide new information that is not currently available. The results from Phase I and Phase II activities will be used in an interim assessment of the critical contaminants, fish prey species, and habitats and times to provide focus to the next phase. The interim assessment and information will be made available on a GIS based web site for wide spread access.

**Phase III.** Information from previous phases will be used to design and conduct six laboratory and field study Tasks that will investigate the effects of selected contaminants on selected fish prey species (including pulse and combined effects), toxicant identification and bioavailability, resident species sensitivity, and *in situ* effects of contaminants on fish prey, providing field verification of laboratory toxicity results. The field studies represent a particularly important component of this project that will attempt to demonstrate actual linkages between contaminants and fish prey.

**Phase IV** will be an integrated, comprehensive, assessment of the potential for direct contaminant effects on chinook salmon and delta smelt life stages and their prey species, including an assessment of the potential for food limitation due to toxic effects. It will provide specific guidelines for reducing the risk of contaminant impacts on key fish and prey populations. We will also produce guidelines for measurement and toxicity testing for pesticides in future monitoring programs, such as CMARP.

The proposed project will benefit the Bay-Delta ecosystem by identifying specific contaminants that pose the highest risk to successful salmon and delta smelt restoration activities. Knowledge of specific contaminants, and the most likely mechanisms of exposure, dose, and effects of fish and their prey will provide focus for management actions to reduce or mitigate sources of those contaminants in specific habitats and times.

The major strengths of this proposal are the use of laboratory and field studies to understand contaminant effects and the multidisciplinary team of nationally recognized Principal Investigators (PIs) with local expertise in chemistry, toxicology, ecology, and salmon biology. The PIs have been actively involved in CALFED programs, as well as other important Bay-Delta programs. Major components of this study have undergone extensive review by the Interagency Ecological Program's Contaminant Project Work Team. The PIs will formally interact with an external Project Advisory Committee to ensure rigorous project oversight and approval of study designs adapted to achieve project objectives. The project will be conducted under a detailed quality assurance project plan based on those used in other major programs in the region.

The study cost is \$2,495,770 over three years. Matching funds may be available from several sources (pesticide manufacturers, California Urban Water Agencies), and in-kind services from several sources have been identified (Delta Keeper, RMP, USGS). This cost for the proposed studies are commensurate with the need for a comprehensive integrated project capable of providing the information necessary to adequately assess contaminant risks to key Delta species. No such project have been conducted, and we present an opportunity to produce that information, critical to the success of CALFED and ecosystem restoration in the Bay-Delta.

## PROJECT DESCRIPTION

**Proposed Scope of Work.** This project addresses two integrally-linked Water Quality Focused Actions identified in the Proposal Solicitation Package (PSP): one to perform toxicity testing, identify toxic agents in toxic samples (e.g., Toxicity Identification Evaluations), and develop toxicity testing methods using Delta species, and the other to develop a monitoring strategy to estimate pesticide use by watershed, both as reported to Department of Pesticide Regulation and unreported use.

The proposed study has two objectives:

- 1) Assess the potential for contaminant effects (including pesticides) on spring and fall run chinook salmon and another important resident fish (probably delta smelt), and on the resident invertebrates that are major prey for the life stages of those fish.
- 2) Identify and prioritize potentially problematic pesticides and develop guidelines for future monitoring of pesticides and subsequent interpretation of the monitoring data.

The study is organized into four sequential Phases, each with several Tasks. This structure allows for the implementation of an adaptive project management strategy whereby the development of new information modifies and focuses subsequent study tasks. As such, and due to space limitations, detailed study plans are not included, but will be prepared and approved by the proposed Project Advisory Committee (see Monitoring and Data Collection).

### *Phase I: Review of Existing Information*

**Task 1. Review and Synthesize Existing Information.** The results of monitoring, previous studies, and the scientific literature will be reviewed to obtain information about 1) the nature, concentrations, and toxicity of pesticides and other contaminants, 2) potentially problematic pesticides, including those that are currently unmonitored. This effort will utilize DPR's Pesticide Use Report Database, but will also take into account unreported use. 3) the transport, fate, and effects of the pesticides and other contaminants identified above, 4) the diets and feeding of salmon and one other important resident fish (delta smelt will probably be targeted, but depending on the information obtained, we may choose another species). Information on food limitation, distributions of prey and the various fish life stages at different times in the Bay-Delta, and their sensitivity to contaminants will be obtained.

### *Phase II: Fill Existing Information Gaps*

**Task 2. Determine Basic Toxicity Information for Undocumented Contaminants.** It is expected that there may be little, if any, information regarding toxicity to aquatic organisms for many of the pesticides identified in Task 1. Toxicity tests using standard EPA test species will be performed for those contaminants lacking information, in order to determine the relative toxicity of contaminants known to be used in the watersheds. This information will then be used to prioritize contaminants in terms of their potential effects on Delta species.

**Task 3. Characterize Salmon Diets and Tissue Contamination.** Out-migrating juvenile chinook salmon have been collected at locations spanning the San Francisco Estuary from 1995-1998 by the National Marine Fisheries Service. Considerable data have been generated from these samples; however, characterization of contaminant and stomach content data have not been completed due to limited resources. Those analyses will be completed to generate new and valuable information which will elucidate contaminant levels in the fish and their food organisms, where contaminant sources occur within the Estuary, and whether these contaminant levels are potentially harmful to juvenile salmon and/or to their food resources.

**Task 4. Characterize Sediment Contamination and Toxicity in the Delta.** Sediment contamination and toxicity are currently being assessed in the lower Sacramento River and in San Francisco Bay. However, there is very little information about contamination and/or toxicity of sediments in the Delta. Samples will be analyzed for contaminant concentrations in sediments (bulk and porewater) and, where possible, screened against existing sediment quality guidelines, ambient water quality criteria, and other known effects thresholds. Sediment bioassays and benthic community data (from DWR) will also be used to identify where concentrations may be affecting organisms.

**Task 5. Identification of Contaminants, Species, and Habitats At-Risk.** Based upon the information developed in Phase I and II of this study, we will conduct an interim assessment (ala Bennett, 1996) to 1) identify contaminants, including pesticides most likely to be adversely impacting aquatic organisms, particularly salmon and delta smelt and their prey, 2) a ranked list of resident invertebrates that are important prey items that may be adversely impacted by contaminants, 3) a ranked list of specific habitats with the ecosystem that are "at-risk" to adverse contaminant impacts. That information will be put into a GIS-based world wide web site, and will be used to guide the Tasks in Phase III.

*Phase III: Generate New Information*

**Task 6. Develop and Evaluate Toxicity Identification Evaluation (TIE) Methodology.** TIE procedures to identify previously uncharacterized contaminants (pesticides) in toxic samples of ambient water and sediment will be developed and validated. The TIE procedures will utilize published EPA Phase I, II and III TIE methods as guidance. In conjunction with Task 7, TIE procedures will be designed to identify the bioavailable fraction of the contaminant. The TIE procedures will be validated with selected priority resident species in intra-laboratory testing.

**Task 7. Determine Factors Affecting the Bioavailability of Key Pesticides.** The measurement of pesticides in water samples typically includes fractions sorbed to colloids and/or dissolved organic carbon, whether or not the sorbed chemical is actually available to aquatic organisms. Sorption of chemicals to organic matter will be evaluated in laboratory studies to determine their bioavailability with varying concentrations and types of natural organic matter. A combination of phase separation methods, bioassays, and chemical analyses will be used to quantify the bioavailable fraction.

**Task 8. Develop Toxicity Testing Methods and Toxicity Information for Resident Delta Species.** Acute and (sub-)chronic toxicity tests of contaminants identified in Task 5 will be conducted on relevant early life stages of salmon and delta smelt, zooplankton species, and/or benthic invertebrate species (identified in Tasks 1, 2, and 5). Sub-chronic exposures will incorporate sublethal endpoints (e.g., development and growth) where practical. Each chronic exposure will be duplicated to verify toxic response to each contaminant tested.

**Task 9. Effects of Pulses of Contaminants.** Toxicity information for most contaminants is based on tests conducted using constant exposure concentrations during a fixed time period. Toxicity tests will be conducted on priority species using pulses of contaminants of concern. Appropriate ambient exposure profiles for each of the contaminants of concern will be determined using monitoring data from key habitats identified in Task 5, above. Appropriate test species, test duration, and "pulse" characteristics for the toxicity tests will be determined based on information obtained in Tasks 1 through 8.

**Task 10. Determine Interactive Toxicity of Contaminants.** Toxicity studies will be conducted to determine if contaminants-of-concern which co-occur in habitats occupied by

priority species produce non-additive, additive, or synergistic toxicity. The interactive toxicity of the contaminant mixtures to selected test species will be determined. Pairwise comparisons of interactions will be performed for several different classes of pesticides (e.g., OP pesticides + carbamates, carbamates + pyrethroids, etc).

**Task 11. Field Validation and Experiments of Contaminant Effects on Zooplankton and Benthos.** The purpose of this Task is to verify that contaminant effects demonstrated in laboratory studies actually occur in the field, and to link contamination and effects on fish prey species in the field. Field studies will be conducted at one or more sites expected to have elevated contaminants and/or sensitive resident organisms. On-site flow-through bioassays will be conducted utilizing a mobile laboratory coincident with *in situ* field sampling of zooplankton and benthos at appropriate intervals to reliably relate changes in population response variables to ambient contaminant concentrations. Contaminant concentrations will also be measured. This important study Task will demonstrate whether pesticides and other contaminants are actually affecting fish prey species in the surface waters of the Bay-Delta.

*Phase IV: Deliverables*

**Task 12. Assessment of Contaminant Impacts on Salmon, Delta Smelt, and their Prey.** The information from the above Tasks will be used to assess potential adverse effects of specific contaminants on salmon, and other key fish species, and/or their food organisms. Assessments will be based on evidence of where the prey organisms, fish, and larvae are, when, and to what ambient concentrations they are exposed, whether any exposures could result in biological effects or accumulation by salmon, or in food limitation due to reductions in their prey from contaminant effects. Fish prey species, habitats, and times of greatest risk, and contaminants that pose the greatest risk will be identified. Demographic models of population responses to contaminants will also be used. Rates from the proposed laboratory studies and existing data on ambient background effects will be used to estimate the likely overall effects of contaminants on the foodweb organisms.

**Task 13. Monitoring Guidelines for Pesticides.** This task will integrate the information on pesticide use patterns, fate and transport, and toxicity, as well as the factors that affect toxicity such as bioavailability, effects of pulsed exposures, and interactions between co-occurring pesticides, to develop guidelines for appropriate monitoring of pesticides in the ecosystem, modification of ongoing monitoring programs, and planning for future monitoring programs (e.g., CMARP). This will include a "ranked" list of pesticides of concern and their corresponding biologically-relevant detection limits, as well as information with which to interpret the subsequent pesticide concentration data.

**Task 14. Project Management.** The technical aspects of this project will be managed by the PIs as a committee. One or more of the PIs will have technical responsibility for each Task (Table 1). Oversight will be conducted by the proposed Project Advisory Committee (see Monitoring Methods). Project administration and contract management, including Task coordination, reporting, contract management, and accounting, will be conducted at SFEI.

Location and/or Geographic Boundaries of the Project. The geographic boundaries of this project are dictated by the life cycles of salmon and delta smelt. We anticipate that most of the sampling and field verification studies proposed will occur in the Delta and Northern San Francisco Bay. Figure 1 shows the generalized geographic location of our study. It includes San Francisco Bay, the Delta, the Sacramento and San Joaquin Rivers, and the numerous tributaries that support salmon spawning grounds.

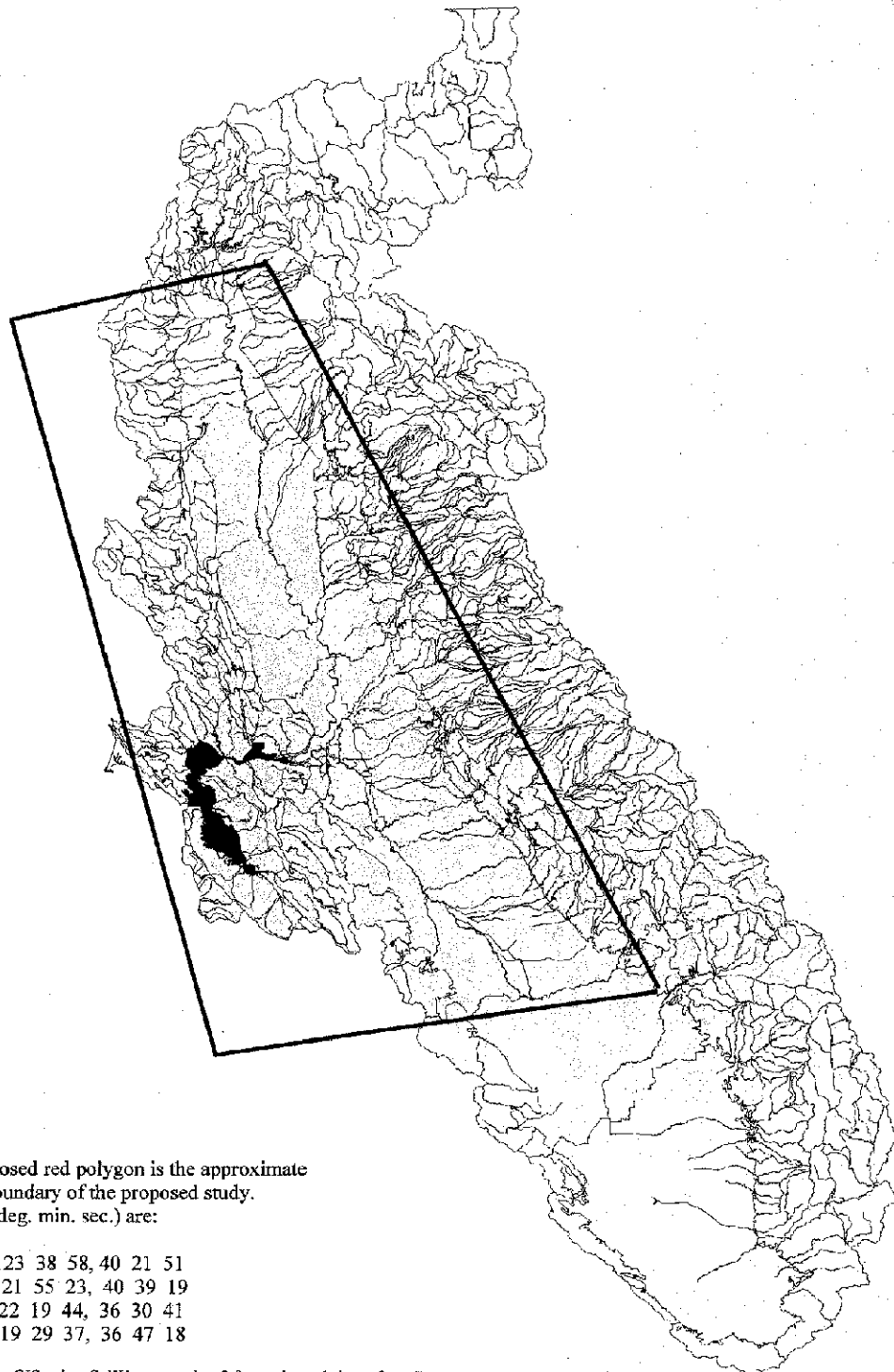
**Table 1. Cross-listing of Lead and Participating Investigators for each Task.**

	<b>Lead Investigator(s)</b>	<b>Participant(s)</b>
<b>Investigator</b>	<b>By Task(s)</b>	
Brian Anderson (BA)	2, 8	1, 5, 12
John Hunt (JH)	2, 4, 8	1, 5, 12
Wim Kimmerer (WK)	11, 12	1, 5
Kathryn Kuivila (KK)	1, 7, 13	5, 12
Bruce MacFarlane (BM)	3	5, 12
Jeff Miller (JM)	6, 9, 10, 11	1, 5, 12
Scott Ogle (SO)	4, 5	1, 12
Bruce Thompson (BT)	1, 11, 12, 14	5, 13

<b>Task</b>	<b>By Investigator(s)</b>	
Task 1	BT, KK	All
Task 2	BA	JH, KK
Task 3	BM	BT
Task 4	JH, SO	BA, KK
Task 5	SO	All
Task 6	JM, KK	SO
Task 7	KK	JM
Task 8	BA	JH, SO, KK
Task 9	JM	KK, SO
Task 10	JM	KK, SO
Task 11	WK, BT, JM	KK
Task 12	BT, WK	All
Task 13	KK	SO, BT
Task 14	BT	



**Figure 1. Map showing California's Central Valley and Bay Area watersheds.**



The superimposed red polygon is the approximate geographic boundary of the proposed study. Coordinates (deg. min. sec.) are:

NW corner: 123 38 58, 40 21 51  
NE corner: 121 55 23, 40 39 19  
SE corner: 122 19 44, 36 30 41  
SW corner: 119 29 37, 36 47 18

(Map from STEI's GIS using CalWater, version 2.0; creeks and rivers from EPA RiverReach coverages)

## ECOLOGICAL/BIOLOGICAL BENEFITS

**Primary Ecological/Biological Objectives.** The ecological objective of this project that would benefit the entire Rivers and Bay-Delta ecosystem are 1) identify specific contaminants that are most likely to have an effect on chinook salmon and delta smelt life stages, and those fish's prey species in space and time, and 2) produce detailed guidelines for future pesticide monitoring.

This project will focus on two of the highest priority at-risk fish species, spring and fall run chinook salmon, and probably delta smelt. However, if another important resident fish species is found to be more at-risk in our Task 5 interim assessment, we may opt to study it instead of delta smelt. We will consider information about acute toxicity to all life stages, but will focus on their food resources. The study considers all salmon and delta smelt habitats, but will focus on the lower Sacramento and San Joaquin Rivers, and the Bay-Delta estuary, important habitats for salmon migration and feeding, and as the primary delta smelt habitat. We will focus on contaminants which was identified as a stressors for salmon and delta smelt in the Ecosystem Restoration Plan wherein toxic substances were considered to be a threat to delta smelt populations. Elimination of contaminants as a stressor was identified as a Stage 1 expectation for salmon.

It is necessary to identify specific contaminants that are most likely related to biological impacts before effective remedial actions can be taken to control or mitigate their sources. Information about the location and timing of pesticides, or other contaminants, and the potential for exposure of fish and their prey species will benefit CALFED restoration efforts by informing restoration designs that may minimize such exposures. Improved methods of pesticide measurement along with information that facilitates the interpretation of those measurements will benefit future monitoring programs such as CMARP by making the data they produce more comprehensive and relevant.

This project is needed because current knowledge of potential stressors such as contaminant concentrations and duration, key Delta species sensitivity, and habitat exposure is insufficient to determine whether restoration efforts will be impeded by contaminant effects on threatened species. Without specific knowledge in these areas, policies aimed at non-specific and wide-spread pollution reduction may not be effective. The proposed project will benefit restoration efforts by allowing managers to include knowledge of contaminants, species, locations, and times into their actions in order to provide the greatest benefit to key Delta fish species and prey populations.

A secondary benefit of the proposed study is the advancement of scientific knowledge of watershed-scale pollution and its effects on estuarine systems. Refinements of chemical analytical methods for currently unmeasured but widely used pesticides, better fingerprinting of responsible chemicals in improved toxicity identification evaluations (TIEs), and a better understanding of ecological interactions among key fish species, their prey organisms, and water quality stressors will contribute to our knowledge base.

Conceptual models of the life histories of chinook salmon and delta smelt developed through CMARP will be used to guide this project. This study is designed to evaluate the general hypothesis that contaminants exist in surface waters at concentrations that have a direct or indirect adverse effect on salmon and delta smelt, and their invertebrate prey. Hypotheses and questions that will be addressed by each Task are listed on Table 2. The Task-specific questions will also be used to evaluate several secondary hypotheses related to the general hypothesis stated

above. These secondary hypotheses are: a) not all contaminants are equally likely to cause environmental impacts, because of their variable ambient concentrations, bioavailability, and toxicity (Tasks 2, 4, 6, 7, 9); b) Delta species have variable contaminant sensitivities, and resident species may be more sensitive than standard test species (Tasks 2, 8); c) some Delta waterways are more likely than others to exhibit toxic concentrations (Task 4, 5, 12); d) organisms exposed to ambient chemical concentrations in the field will respond similarly to test organisms exposed to similar concentrations in the laboratory (Task 11); and e) field populations of invertebrates exposed to elevated ambient contaminant concentrations will respond by exhibiting decreases in abundance and/or other indications of measurable ecological impact (Task 11). There are probably other questions that will be answered by the proposed study. Since we will be adaptive, focusing on contaminants, species, and habitats that are shown to be most at-risk in the Phase I and II activities, new information will no doubt be generated.

Our approach is ecosystem based since we will integrate information about pesticide use, concentrations and exposures in various habitats at various times, sensitivities of resident salmon and delta smelt food items throughout the study area coincident with locations of fish life stages. The proposed Task 11 field studies are an especially strong component of our proposed project. It is imperative that any laboratory testing be verified and corroborated by a complementary set of field studies that demonstrate actual ecosystem linkages and effects. We believe that the proposed project will provide a major advancement in understanding about how contamination is linked to salmon and delta smelt abundances.

Linkages This is a new project that has its origins in several existing monitoring programs and past research project. Fish abundance data from decades of study by the IEP, research by the USGSs programs in the Bay-Delta, monitoring and studies by SFET's Regional Monitoring Program, and CVRWQCB studies including Bay Protection and Toxic Clean-up Program, have all contributed to the contention that species declines and contaminant increases may be linked. Although each program has produced excellent information, there has not been a comprehensive effort to study the linkages between fish declines and contamination. The proposed study builds on previous work. The results from the proposed study will also be useful in the development of monitoring studies, such as CMARP. Methods developed for measurement of pesticides, toxicity testing of resident species, and Toxicity Identification Evaluations may be directly transferable to a monitoring context.

The proposed project would provide information fundamental to two of CALFED's primary objectives: to improve aquatic habitat and ecological function, and to provide good water quality for all beneficial uses. More specifically, this project addresses aspects of CALFED's Ecosystem Restoration Program (ERP) Goals 1, Threatened and Endangered Species, and Goal 6, Aquatic Toxicity as described in the CALFED Strategic Plan for Ecosystem Restoration (CALFED, 1999). The project addresses aspects of the ERP's Strategic Objectives for the restoration of spring and fall run chinook salmon (CALFED ERP, Vol. 1, pg. 220 and 222 respectively) and delta smelt (CALFED ERP, Vol. 1, pg. 194). Achieving the ERP targets for each species' recovery (salmon, ERP, Vol. 2, pg. 26, 28; delta smelt, Vol. 2, pg. 20) would be facilitated by information from this project as contaminants is listed in the ERP as a stressors for each species, and included as part of Stage 1 expectation (salmon) and as CALFED programmatic actions. The project will also address aspects of the Strategic Objectives 2 and 3 for Contaminants (ERP Vol. 1, pg. 506 - 507). The information provided by this project will facilitate Target (ERP Vol. 2, pg. 113) by identifying which contaminants source control actions should focus on.

System-Wide Ecosystem Benefits. The study is proposed as an integrated investigation of many contaminants-of-concern throughout the watershed, and will consider many critical species and habitats in order to identify those at greatest risk. Contaminant transport, thus exposure is linked to runoff and flows, as is salmon life history. Understanding linkages between contaminants and species in space and time will result in actions that will benefit fish throughout the ecosystem. This project will be coordinated closely with any CALFED funded projects addressing the Focused Action in the current PSP on chronic fish toxicity in order to avoid duplication and to optimize the information gained from both projects.

Compatibility with Non-Ecosystem Objectives. The proposed study will support CALFED's objectives of providing water of suitable quality to support ecosystem restoration. Information derived from this project will also assist in decision-making regarding reuse of dredged materials for Delta habitat restoration and flood control projects, and many actions in the Water Quality Program Plan and Watershed Management Program. Information and methodologies derived from the project will also be available to support a number of non-ecosystem objectives, including efforts to ensure reliable water supply, channel maintenance, dredged material disposal, levee system integrity, water transfers, and watershed management. No conflicts with any of these CALFED objectives are expected from the conduct or results of this study.

Third party benefits include the potential for significant economic benefit to agriculture and other Delta-related activities through an enhanced ability to focus management action on specific chemicals and high-risk habitats, thereby avoiding costly and time-consuming regulatory efforts directed at low-risk activities throughout the watershed. In addition, scientists and resource managers in other regions involved with contaminant issues in freshwater and estuarine systems will benefit from access to high quality scientific information developed by the proposed study. Future scientific and monitoring studies, including those envisioned for the Delta, will be able to build on the chemical, toxicological, and ecological data provided.

## TECHNICAL FEASIBILITY AND TIMING

The strategies, methods, and analyses proposed are based on the extensive experience and knowledge of the Principal Investigators. The Phase I and II results will be used to generate the design of the Phase III studies. The PIs will work with the Project Advisory Committee to identify the most efficient and effective methods to apply to the proposed experiments.

For Task 1, USGS has the latest version of the DPR Pesticide Use Report data base and the technical expertise to do retrievals by watershed, timing, and/or location. For Task 3, Dr. MacFarlane has conducted some, but not all of the sample and data analysis from a NMFS project on salmon diets and tissue contamination, demonstrating that the work can be done. For the laboratory testing and analysis Tasks, the participants will use standard protocols and variations of those for new species (see methods). Chemical verification of contaminant concentrations may involve methods development for some pesticide compounds in cooperation with manufacturers. The PIs have extensive experience in the design, construction, and operation of flow-through bioassay systems capable of generating ambient exposure patterns of a variety of contaminants (Miller, 1986; Hunt and Anderson, 1989), conducting all phases of TIEs with a variety of aquatic organisms (Miller *et al.*, 1997; Hunt *et al.*, In press), development of innovative approaches for identification and confirmation of toxicity (Bailey *et al.*, 1996), culturing new species (Anderson *et al.*, 1994), protocol development (Hunt *et al.*, 1997), adapting existing toxicity test protocols for new species (Anderson *et al.*, 1996), and evaluating interactive toxicity of diazinon and chlorpyrifos (Bailey *et al.*, 1997), and relating ambient concentrations to toxicity (Thompson *et al.*, In press). Collection and maintenance of resident invertebrate species for bioassays will be challenging, and may not be successful for all species. However, the Investigator's experience will be invaluable in finding ways to use species for which protocols do not exist.

Complimentary sampling strategies using *in situ* bioassays and standard field methods will be used in Tasks 11 because no single approach can provide adequate information. The PTs have substantial experience in designing, building and operating self-contained bioassay systems (Anderson *et al.*, 1999), in conducting bioassessments, and field sampling (Thompson, *et al.*, 1997; Kimmerer *et al.*, 1998; Hunt *et al.*, 1998). Similarly, a variety of methods will be used in the Task 12 assessments. Ecological risk assessment methods and population modeling methods are well developed and commonly used in environmental science (see methods).

No sampling of endangered or threatened fish species is anticipated. If necessary, salmon life stages may be obtained from hatcheries, and delta smelt may be obtained from the UC Davis culture.

## MONITORING AND DATA COLLECTION METHODOLOGY

Since this is not a restoration project, effectiveness monitoring will not be conducted *per se*. Instead, the establishment of sound quality control practices will be used to evaluate the quality of the data generated in this study. The QAPP is described below. The remainder of this section generally describes sampling and analytical methods to be used in this study.

**Biological/Ecological Objectives.** The biological/ecological objectives, use of conceptual models, and hypotheses for this study were stated in the Ecological / Biological Benefits section. Specific hypotheses/questions, and evaluation approaches proposed for each Task are on Table 2.

### Monitoring Parameters and Data Collection Approach.

Aquatic toxicity testing with standard test species will be performed using standardized US EPA guidelines for acute and chronic testing (US EPA 1993, 1994a, 1994b, 1995). Sediment toxicity tests will be also be performed using standardized US EPA guidelines (US EPA 1994c, 1994d). Protocols for toxicity testing with resident species will be adapted from these EPA guidelines. TIEs will also be adapted from existing US EPA guidelines (US EPA 1991a, 1991b, 1992a, 1992b). Chemical analyses of water, sediment, and/or tissue samples will be performed following approved US EPA analytical methods. For analytes requiring increased sensitivity (i.e., lower detection limits), performance-based methods which have been developed by and are in current use by the USGS analytical laboratories will be employed. The Task 12 assessment will use standard ecological risk assessment methods (Suter *et al.*, 1993; EPA, 1998). That assessment together with results of demographic modeling (e.g. Kimmerer and McKinnon, 1987), will provide a weight-of-evidence for contamination effects.

**Data Evaluation.** A Quality Assurance Program Plan (QAPP) will be prepared that will describe the data quality specifications to be used for all data collected as part of this study. The QAPP will be based upon the existing QAPPs that have been prepared by the USGS, Regional Monitoring Program, Bay Protection and Toxic Cleanup Program, and IEP. The QAPP will be produced and approved prior to any sampling or testing.

Project Update Reports will be prepared quarterly for each on-going task, and will include a brief review of the progress accomplished during the quarter, as well as summary tables describing all QA/QC-validated data generated to date, and a brief description of the activities planned for that task during the following quarter; these reports will follow CALFED's requirements for reporting format, and submission dates. In addition, Annual Progress Reports will be prepared for the overall project; contents and format of the Annual Progress Report will mirror the quarterly reports. Other products of this project will include a summary and synthesis of the Task 1 information review, a GIS-based world-wide web site, and Final Reports on Task 12 assessment, Task 13 guidelines. Several peer-reviewed publications are anticipated.

**Project Advisory Committee.** A Project Advisory Committee (PAC) will be formed that will advise the Principal Investigators on all aspects of the project including technical approach, validity, feasibility, cost effectiveness, and will facilitate external peer review of project products. They will review and approve detailed work plans for each Task and the QAPP prior to any work being conducted. This oversight function will be especially important to this project owing to its adaptive strategy whereby work plans cannot be developed until preceding work is completed. The PAC will be composed of CALFED, agency, and stakeholders representatives (CDFG, CDFG, State and Regional WQCBs, USEPA, CUWA, DWR, Delta Keeper, pesticide manufacturers), and other scientists with expertise in the disciplines required by the project (analytical chemistry, environmental toxicology, fish, zooplankton, benthic biology, etc.).

**Table 2. Summary of Monitoring and Data Collection Information for Sampling Tasks.**

<b>Hypothesis/Question to be Evaluated</b>	<b>Monitoring Parameter(s) and Data Collection Approach</b>	<b>Data Evaluation Approach</b>
<b>Task 2.</b> What is the toxicity of those contaminants of potential concern for which no toxicity data is available?	Water, similar in quality to Delta waters, will be spiked with chemicals using standard EPA procedures. Static-renewal dose-response toxicity tests will follow EPA procedures (1991). Chemical verification of test concentrations will follow methods described in Zaugg <i>et al.</i> (1995).	Parametric and non-parametric statistics will be used for hypothesis testing and point estimation as per US EPA statistical guidelines for each chemical and species. Chemical analyses will be validated as per the QAPP. Relative toxicities of all chemicals will be compared based on these values.
<b>Task 3.</b> Which invertebrate species are important components of juvenile Chinook salmon diets, and what are the contaminant residue levels in these food items and in the consuming fish tissues?	Existing samples of stomach contents will be analyzed for species composition. Samples of the food organisms and the corresponding fish tissues will be analyzed residue levels of contaminants of concern.	Stomach content analyses will be verified by repeat analysis of 10% of the samples. Chemical analyses of the food organisms and fish tissues will be validated as per the QAPP. Contaminant residue levels will be assessed as potential evidence for adverse effects.
<b>Task 4.</b> Sediment contamination and toxicity has been, and is being, characterized for the Sacramento River and San Francisco Bay. But not for the Delta. Are the Delta sediments toxic?	Sediment samples from 8 Delta stations will be collected using standard ASTM procedures. Static toxicity tests will follow ASTM procedures (1997). Chemical analyses of bulk sediment and pore water will follow procedures described in Zaugg <i>et al.</i> , (1995) and Anderson <i>et al.</i> (1998).	Sediment chemistry will be compared to sediment quality guideline values; porewater concentrations will be compared to federal/state water quality criteria. Benthic community metrics will be compared to reference site values (Canfield <i>et al.</i> 1996). These analyses will be combined in a weight-of-evidence approach to determine if (and which) contaminants found in Delta sediments have potential to impact invertebrate prey populations important to key fish species.

**Table 2. Summary of Monitoring and Data Collection Information (continued).**

<p><b>Task 6.</b> How can a definitive identification of the specific contaminant that is causing toxicity be accomplished?</p>	<p>TIE methods will be adapted from existing US EPA TIE protocol, and implemented with resident species and any newly-identified pesticides of concern.</p>	<p>The TIE methods developed in this Task will be evaluated and validated in intralaboratory studies. Following validation, the TIE methods will be used to identify the toxic constituents in samples of water and sediments collected from the field study sites.</p>
<p><b>Task 7.</b> How do natural water quality characteristics (e.g., dissolved organic carbon) affect the bioavailability of pesticides?</p>	<p>Various phase-separation methods, bioassays, and chemical analyses will be employed to assess the bioavailability of pesticides sorbed to organic carbon.</p>	<p>Statistical analyses of the bioassays will follow US EPA guidelines; chemical analyses will be in compliance with all QAPP QA/QC data validation requirements.</p>
<p><b>Task 8.</b> What is the toxicity of contaminants of concern to resident Delta species, particularly key food organisms for salmon and delta smelt?</p>	<p>Key resident organisms will be collected from the field or purchased from commercial suppliers. Toxicity tests will be performed with these organisms for the potential contaminants of concern. Test solution contaminant concentrations will be verified by chemical analyses.</p>	<p>Parametric and non-parametric statistics will be used for hypothesis testing and point estimation as per US EPA statistical guidelines for each chemical and species. Sensitivity of Delta species will be compared to contaminant concentrations measured in Delta waters and sediments to determine relative risk of Delta species to chemical contamination.</p>
<p><b>Task 9.</b> Laboratory tests are typically based upon exposure of the test organisms to constant concentrations of the chemicals in question. However, contaminant concentrations in the real world tend to occur as pulses. How does a "pulsed" exposure to contaminants affect test organisms.</p>	<p>Flow-through bioassays will be performed in which the contaminants of concern are metered into the test solutions so as to provide "pulsed" exposures characteristic in magnitude and duration to the actual conditions observed in the field.</p>	<p>Comparison of the toxicity information from this task with available data on actual concentrations of the contaminants of concern in key Delta habitats will permit assessment of real world exposure scenarios. Results from these studies will also help guide the later field studies.</p>



**Table 2. Summary of Monitoring and Data Collection Information (continued).**

<p><b>Task 10.</b> Ambient water typically has varying concentrations of various contaminants co-occurring in the same sample. Are there any significant interactions between these co-occurring contaminants that affect their toxicity?</p>	<p>Toxicity tests will be performed in which the test solutions contain two contaminants of concern at varying proportions relative to each other. Such pairwise comparisons of interactions will be performed for several different classes of pesticides (e.g., OP pesticides + carbamates, carbamates + pyrethroids, etc).</p>	<p>The interactive toxicity of the contaminants of concern will be determined by normalizing the toxicity data to Toxic Units (TUs). Comparison of the expected TUs, based on contaminant concentrations, with the actual TUs observed in the bioassays will determine if the toxicants interact to produce additive, non-additive or synergistic toxicity to the test species.</p>
<p><b>Task 11.</b> Laboratory tests of ambient waters and sediments have indicated significant likelihood of toxicity due to some contaminants at some times of the year and to some types of invertebrates. Are such adverse effects actually occurring in the field,?</p>	<p>Based upon the information gathered by the earlier tasks in this study, specific habitats will be identified as being "at-risk" due to critical co-occurrences of critical fish life stages, toxicant-sensitive invertebrate species, and/or the expected presence of contaminants at toxic concentrations. Both on-site (i.e., streamside) and <i>in situ</i>, close interval sampling will be performed to assess the effects of actual contaminant exposures to natural populations of zooplankton and benthos.</p>	<p>Water and sediment concentrations of the contaminants of concern will be determined and compared to the toxicity data generated in earlier parts of this study. Zooplankton and benthic community metrics will be compared on a temporal ("before and after") and on a spatial (relative to reference sites) bases. These analyses will be combined in a weight-of-evidence approach to determine if contaminants are in fact impacting invertebrate prey populations important to key fish species.</p>

## LOCAL INVOLVEMENT

Since this project is a laboratory and field sampling project, no private landowners will be impacted. Field sampling, including the *in situ* bioassay lab proposed in Task 11 will be situated on public lands. We do not anticipate any third party impacts.

Letters of intent have been sent to the Contra Costa County Board of Supervisors, The Delta Protection Commission, and BCDC (see Attachment).

Public Involvement Plan. If our proposal is funded, and upon approval of detailed study plans, we will identify and communicate with local watershed groups and conservancies in the regions where we will be sampling. We will identify an appropriate representative of each group and establish communication with them about our project. The PIs will actively seek opportunities to present plans and results to public groups. Since the San Francisco Bay Baykeeper is a member of SFEI's Board of Directors, he will be actively informed. The Deltakeeper will be asked to participate on the Project Advisory Committee. We will also communicate with other major stakeholder programs such as CALFED's Watershed Workgroup and Water Quality Technical Team, the Sacramento River Watershed Program and the Regional Monitoring Program. The PIs will write summaries of the project to be included annually in any of the several environmental science: IEP Newsletter, SFEI's RMP News, or the San Francisco Estuary Project's ESTUARY Newsletter. Our Public involvement activities will be reported in our Quarterly Reports. More technical communications will occur through presentations at national and regional scientific meetings. The GIS based world wide web site that will be established in Task 5 will also be an important means of communication about the results of this study.

# San Francisco Estuary Institute



**180 Richmond Field Station**

1325 South 46th Street  
Richmond, California 94804  
Office (510) 231-9539  
Fax (510) 231-9414

April 14, 1999

Supervisor Joe Canciamilla, Chair  
County of Contra Costa  
Board of Supervisors  
651 Pine Street  
Martinez, CA 94553

Dear Supervisor Canciamilla:

Per instructions stated in the CALFED Bay-Delta Program, February 1999 Proposal Solicitation Package, this letter serves to notify you of our intent to submit the project proposal, *An Evaluation of the Effects of Pesticides and other Contaminants on the Fishery Food Chain Resources of the Sacramento-San Joaquin River Basins and the San Francisco Estuary and Development of Pesticide Monitoring Guidelines.*

If you have any questions, please contact me.

Very truly yours,

Margaret R. Johnston  
Executive Director

# San Francisco Estuary Institute



180 Richmond Field Station  
1325 South 46th Street  
Richmond, California 94804  
Office (510) 231-9539  
Fax (510) 231-9414

April 14, 1999

Robert Tufts, Chair  
San Francisco Bay Conservation  
and Development Commission  
30 Van Ness Avenue, Room 2011  
San Francisco, CA 94102

Dear Mr. Tufts:

Per instructions stated in the CALFED Bay-Delta Program, February 1999 Proposal Solicitation Package, this letter serves to notify you of our intent to submit the project proposal, *An Evaluation of the Effects of Pesticides and other Contaminants on the Fishery Food Chain Resources of the Sacramento-San Joaquin River Basins and the San Francisco Estuary and Development of Pesticide Monitoring Guidelines*.

If you have any questions, please contact me.

Very truly yours,

Margaret R. Johnson  
Executive Director

# San Francisco Estuary Institute



## 180 Richmond Field Station

1325 South 46th Street  
Richmond, California 94804  
Office (510) 231-9539  
Fax (510) 231-9414

April 14, 1999

Margit Aramburu, Director  
Delta Protection Commission  
14215 River Road  
P. O. Box 530  
Walnut Grove, CA 95690

Dear Ms. Aramburu:

Per instructions stated in the CALFED Bay-Delta Program, February 1999 Proposal Solicitation Package, this letter serves to notify you of our intent to submit the project proposal, *An Evaluation of the Effects of Pesticides and other Contaminants on the Fishery Food Chain Resources of the Sacramento-San Joaquin River Basins and the San Francisco Estuary and Development of Pesticide Monitoring Guidelines.*

If you have any questions, please contact me.

Very truly yours,

Margaret R. Johnston  
Executive Director

# San Francisco Estuary Institute



## 180 Richmond Field Station

1325 South 46th Street  
Richmond, California 94804  
Office (510) 231-9539  
Fax (510) 231-9414

April 14, 1999

Dennis M. Barry, AICP, Director  
County of Contra Costa  
Community Development Department  
651 Pine Street  
North Wing - 4<sup>th</sup> Floor  
Martinez, CA 94553

Dear Mr. Barry:

Per instructions stated in the CALFED Bay-Delta Program, February 1999 Proposal Solicitation Package, this letter serves to notify you of our intent to submit the project proposal, *An Evaluation of the Effects of Pesticides and other Contaminants on the Fishery Food Chain Resources of the Sacramento-San Joaquin River Basins and the San Francisco Estuary and Development of Pesticide Monitoring Guidelines*.

If you have any questions, please contact me.

Very truly yours,

Margaret R. Johnston  
Executive Director

## **COST**

Total costs for each Task are shown on Table 3. Several Investigators (and their respective staffs) may participate in each Task (See Table 1). Work by all Investigators except Dr. Thompson will be through sub-contracts with SFEI. Therefore, some tasks have no costs other than subcontract costs.

Because of the adaptive nature of our approach, it is not yet possible to determine the exact details of most Tasks, including the exact costs for each Investigator. However, we have provided the billing and overhead rates for each of PI. If our proposal is funded we will provide much more detailed work plans and cost break-downs to the TRP and CALFED for their approval before any work is conducted.

Table 4 shows the total budget broken into quarterly amounts over the three-year duration of the project. Please note the tasks total to \$2,386,000, there is a five percent contracting fee of \$109,770 which brings the total budget to \$2,495,770. This contracting fee will also be spread evenly over the period of the contract.

Table 5 lists the billing and overhead rates for sub-contractors with notes justifying any overhead calculation over 25%. The overhead rates for SFEI is covered in Table 5, contd.

Table 6. indicates the Projected Timeline of the project.

The total costs for each Task have been carefully considered and represent our best professional judgment about the optimal amount and kinds of work and associated costs.

**Table 3. San Francisco Estuary Institute - Total Budget.**

Task	Direct Labor Hours	Direct Salary and Benefits	Service Contracts	Material and Acquisition Costs	Misc. and other Direct Costs	Overhead and Indirect Costs	Total Cost
Task 1	1,755	30,274	118,500	-	-	11,226	160,000
Task 2	-	-	91,000	-	-	-	91,000
Task 3	-	-	95,000	-	-	-	95,000
Task 4	-	-	58,000	-	-	-	58,000
Task 5	127	6,055	74,700	-	-	2,245	83,000
Task 6	-	-	187,000	-	-	-	187,000
Task 7	-	-	208,000	-	-	-	208,000
Task 8	-	-	332,000	-	-	-	332,000
Task 9	-	-	166,000	-	-	-	166,000
Task 10	-	-	166,000	-	-	-	166,000
Task 11	2,238	60,549	539,000	-	-	22,451	622,000
Task 12	633	30,274	118,500	-	-	11,226	160,000
Task 13	127	6,055	41,700	-	-	2,245	50,000
Task 14	122	5,836	-	-	-	2,164	8,000
Subtotal	5,001	139,043	2,195,400	-	-	51,557	2,386,000
Fee 5%			109,770				109,770
Total	5,001	139,043	2,305,170	-	-	51,557	2,495,770



Table 4. Quarterly Budget.

Task	Quarterly Budget Oct - Dec 1999	Quarterly Budget Jan - Mar 2000	Quarterly Budget Apr - Jun 2000	Quarterly Budget Jul - Sep 2000	Quarterly Budget Oct - Dec 2000	Quarterly Budget Jan - Mar 2001	Quarterly Budget Apr - Jun 2001	Quarterly Budget Jul - Sep 2001	Quarterly Budget Oct - Dec 2001	Quarterly Budget Jan - Mar 2002	Quarterly Budget Apr - Jun 2002	Quarterly Budget Oct - Dec 2002	Total Budget
Task 1	40,000	40,000	40,000	40,000									160,000
Task 2		30,333	30,333	30,334									91,000
Task 3	23,750	23,750	23,750	23,750									95,000
Task 4			19,333	19,333	19,334								58,000
Task 5			16,600	16,600	16,600	16,600	16,600						83,000
Task 6					46,750	46,750	46,750	46,750					187,000
Task 7					52,000	52,000	52,000	52,000					208,000
Task 8					55,333	55,333	55,333	55,333	55,334	55,334			332,000
Task 9					41,500	41,500	41,500	41,500					166,000
Task 10					41,500	41,500	41,500	41,500					166,000
Task 11					88,857	88,857	88,857	88,857	88,857	88,857	88,858		622,000
Task 12											80,000	80,000	160,000
Task 13											25,000	25,000	50,000
Task 14	666	666	666	666	667	667	667	667	667	667	667	667	8,000
Total	64,416	94,749	130,682	130,683	362,541	343,207	343,207	326,607	144,858	144,858	194,525	105,667	2,386,000

**Table 5. San Francisco Estuary Institute/Sub Contracts Billing Rates/Overhead**

Name of Individual	Organization Name	Average Billing Rate	Includes % Overhead	Note
Brian Anderson	UC - Marine Pollution Studies Lab	57	25%	Note 1
John Hunt	UC - Marine Pollution Studies Lab	58	25%	Note 1
Technician	UC - Marine Pollution Studies Lab	38	25%	Note 1
Scott Ogle	Pacific Eco-Risk Lab	100	50%	Note 2
Jeffrey Cotsifas	Pacific Eco-Risk Lab	75	50%	Note 2
Staff Scientist	Pacific Eco-Risk Lab	50	50%	Note 2
Wim Kimmerer	San Francisco State University Romberg Tiburon Center	42.53	51%	Note 3
Bruce MacFarlane	National Marine Fisheries Service	28.5	51.30%	Note 4
Postdoctoral Researcher	National Marine Fisheries Service			
Kathy Kuivila	U.S. Geological Survey	50	96%	Note 5
Jeffrey Miller	AQUA-Science	100	50%	Note 6
Bruce Thompson	San Francisco Estuary Institute	102.14	37%	Note 7
Sarah Lowe	San Francisco Estuary Institute	40.3		Note 7
Jr. Staff	San Francisco Estuary Institute	31.75		Note 7

Note 1: Needs no explanation

Note 2: Negotiated rate

Note 3: Negotiated federal rate with University

Note 4: NOAA federal rate

Note 5: Negotiated USGS rate

Note 6: See Note 3

Note 7: Based on approved Cost Allocation Plan

Table 5, contd.

### SFEI INDIRECT CHARGES

Indirect costs (overhead) are applied according to a Cost Allocation Plan that is submitted to US EPA on an annual basis, pursuant to Circular A-122.

Indirect costs are charged at 37.08% of direct salary and benefits.

Types of expenses charged as indirect:

Costs other than salary

- audit
- bank fees
- depreciation on computer and other equipment (over \$500)
- insurance, liability and errors and omissions
- internet access, e-mail
- office equipment leases and/or maintenance agreements for computers, xerox, postage meter, printer
- office supplies
- payroll service
- phone, including ISDN and data lines
- publications, memberships, dues
- purchase of small equipment (under \$500)
- purchase of software (for routine office use)
- routine and incidental copy costs (large reports or bulk printing is billed)
- routine and incidental postage, faxes, etc.(large mailings billed)
- rent, property tax, and building maintenance
- specialized software licenses for GIS, data management, etc.
- travel and related expenses of Board of Directors and Committee of Science Advisors

Salary and benefits attendant to the following support activities

- general accounting and specific project tracking reports
- computer system operations and maintenance
- Board of Directors and Committee of Science Advisors staffing
- marketing/proposal writing
- office management
- personnel management
- professional development and training
- program oversight
- purchasing
- responding to public requests for information
- web page maintenance

Subcontracting fee.

Separate from labor overhead, a subcontracting fee of 7% of subcontract charges is normally applied. This charge provides for accounting, project tracking and reporting, and auditing of funds.

**Table 6. Project Timeline.**

	YEAR 1				YEAR 2				YEAR 3			
	Oct. 1999				Oct. 2000				Oct. 2001			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Task 1												
Task 2												
Task 3												
Task 4												
Task 5												
Task 6												
Task 7												
Task 8												
Task 9												
Task 10												
Task 11												
Task 12												
Task 13												

## COST-SHARING

The following funding has been tentatively approved pending funding of this project.

<i>Entity</i>	<i>Cash (\$)</i>	<i>In-Kind (\$)</i>	<i>Status</i>	<i>Total (\$)</i>	<i>Footnote</i>
Dow Agro-Sciences	150,000	45,000	Tentative	195,000	1
Novartis	0	45,000	Tentative	45,000	2
CUWA	105,000	15,000	Tentative	120,000	3
Various (to be determined)	50,000	50,000	Speculative	100,000	4
<b>TOTAL</b>	<b>305,000</b>	<b>155,000</b>		<b>460,000</b>	

1. Total funding for 3-year project to be provided in equal yearly installments pending development of peer-reviewed project work products. In-kind services include analysis of sediment and water samples for chlorpyrifos and funding for outside peer review.
2. In-kind work for analysis of sediment and water samples for diazinon.
3. Cash will be provided in equal yearly installments. Year 1 funding approved; Years 2-3 funding is tentative pending CUWA Advisory Board approval.
4. Pending project approval, the project participants pledge to secure additional cash (\$50,000) and in-kind services (\$50,000).

In addition, the proposed project has linkages with previously conducted, on-going or future approved projects that provide the following in-kind cost sharing:

1. USGS will assist in sampling of bed sediments and analyzing them for currently used pesticides (\$18,000 in salaries and supplies). This project overlaps existing USGS fate and transport studies in the Delta (\$75,000 in salaries over 3 years).
2. SFEI projects including the Regional Monitoring Program sampling of water, sediment and bivalve tissues in the study area 3 times annually (\$332,500 in salaries and supplies), and the Episodic Aquatic Toxicity Pilot Study at Mallard Island (\$107,500 in salaries and supplies).
3. NMFS has collected salmon stomach contents and plankton during 1995-98 at a cost of approximately \$410,000. These samples will be analyzed as part of this project.
4. Delta Keeper and Bay Keeper have offered to supply costs and personnel to assist in sampling as needed throughout this project

## APPLICANT QUALIFICATIONS

The Principal Investigators (PIs) that will participate in this study form a multidisciplinary team of recognized experts in contaminant chemistry, toxicity, estuarine ecology, and salmon biology in the Bay-Delta. Several of the investigators are members of the IEP Contaminant Project Work Team that developed Issue Papers about toxicity and pesticides.

The San Francisco Estuary Institute (SFEI), a private non-profit organization dedicated to providing scientific information for Estuary management, will manage and administer this project through sub-contracts to each Investigator. SFEI's success with the San Francisco Estuary Regional Monitoring Program (RMP) has demonstrated their ability to manage large programs with numerous (74) agencies.

**Brian Anderson** holds an MA from the Moss Landing Marine Laboratories and has been a Research Specialist with the University of California at Santa Cruz since 1985. He has served as lead scientist on numerous aquatic toxicology projects for the California State Water Resources Control Board, the California Regional Water Quality Boards, CDFG, EPA, and NOAA, and is currently a PI for sediment toxicity for the RMP. He has developed short-term chronic toxicity test protocols for a number of marine and estuarine species as part of the SWRCB's Marine Bioassay Project and as part of the State's Bay Protection and Toxic Cleanup Program, and has published many papers on the results of those studies.

**John Hunt** holds a MS degree from the Moss Landing Marine Laboratories, and has been a Research Specialist with the University of California, Santa Cruz for the past 15 years. He has authored numerous peer-reviewed journal articles and reports on short-term chronic toxicity test development with mysid crustaceans and other species, sediment quality assessment in a variety of estuarine environments, and watershed investigations of sources and causes of aquatic toxicity. Protocols authored by Mr. Hunt and Mr. Anderson constitute four of the seven included in the EPA west coast toxicity testing methods manual. He is currently involved in sediment toxicity identification evaluation studies in the Sacramento-San Joaquin Delta, and TIE-based watershed studies in the Salinas and Pajaro Rivers, funded by the California State Water Resources Control Board, Regional Water Quality Control Boards, the Department of Fish and Game, US EPA, and NOAA, and is a PI for the RMP.

**Dr. Wim Kimmerer** is a Senior Research Scientist at San Francisco State University's Romberg Tiburon Center. His research has included the influence of predation on community structure, population dynamics of zooplankton and fish, the interaction of plankton with their physical environment, and the influences of human activities on coastal marine environments, and has published numerous peer reviewed papers on those topics. He has been very active in CALFED activities over the past several years. He was a member of the CALFED Strategic Planning Core Team, and Chaired the CMARP System Productivity Workgroup. He was a Principal Investigator for the IEP Entrapment Zone Study and is the chairman of the IEP's Estuarine Ecology Team.

**Dr. Kathryn M. Kuivila** is a research hydrologist at the Water Resources Division of the U.S. Geological Survey in the California District Office in Sacramento, California. Her primary focus of research is on the transport, degradation, and fate of organic contaminants, particularly pesticides, in the San Francisco Bay Estuary. Her research efforts have contributed greatly to understanding riverine pesticide inputs, transport of pesticides during high flow events, and degradation of pesticides within the estuary. She has collaborated on other projects with the Central Valley Regional Water Quality Control Board, California State Water Quality Control

Board, Interagency Ecological Program, U.S. EPA, and California Department of Fish and Game. She is a member of the IEP Contaminants Project Work Team. Dr. Kuivila will coordinate the trace organics analyses for the proposed Tasks.

**Dr. R. Bruce MacFarlane** is a Research Fishery Biologist with the National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz / Tiburon Laboratory in Tiburon. He is a principal investigator of research on the physiology, biochemistry, and ecology of marine and anadromous fishes. His research addresses functional relationships between fishes and their environment using an integrated field and laboratory experimental approach. Currently, his research focuses on the interannual variability of growth and development of juvenile salmonids in the San Francisco Estuary and the influences of environmental factors.

**Dr. Jeff Miller** is President of AQUA-Science, an environmental toxicology consulting company located in Davis, CA. He has over 20 years of experience directing large-scale laboratory and field projects involving acute and chronic bioassays with over 14 freshwater, estuarine and marine species for NPDES dischargers, private clients including major steel and pesticide companies and for CSWQCB, USEPA and USFWS. He has developed many innovative Toxicity Identification Evaluation (TIE) approaches including chemical toxicity fingerprinting and antibody-mediated TIE procedures, methods to assess the interactive toxicity of pesticides, TIE procedures, and application of TIE methods to West Coast aquatic species. He is a member of the IEP Contaminant Effects Team, an instructor for USEPA on effluent TIE methods and has developed and taught advanced TIE workshops at local and national scientific meetings, and has authored many peer-reviewed papers in the area of environmental toxicology.

**Dr. Scott Ogle** is the Research Director at Pacific Eco-Risk Laboratories in Martinez, CA. For the past 15 years, his research has focused on factors affecting toxicity and bioaccumulation of pesticides, petroleum hydrocarbons, and metals to algae, invertebrates, and fish. His current research activities include evaluation of contaminants and toxicity in ambient waters and stormwater runoff in the San Francisco Estuary system. He also directed an assessment of sediment toxicity in the Delta, and has directed or participated in numerous projects encompassing all of the standardized EPA and ASTM test procedures as well as projects involving development of new testing procedures for new species, and is a member of the IEP Contaminant Effects Team.

**Dr. Bruce Thompson** is the Senior Scientist at SFEI with expertise in contamination in the estuary, sediment toxicity, and benthic ecology. He has had over 17 years of experience working on contaminant effects on benthic organisms and monitoring program design, and has published numerous peer reviewed papers on those topics. He was instrumental in the successful start-up of the RMP in 1993 and served as Program Manager through 1997. He is a member of the IEP Management Team, Contaminant Effects Team, Estuarine Ecology Team, chaired the Bay-Delta Contaminants Monitoring Workgroup of CMARP, and served on the state's Bay Protection and Toxic Clean-up Program Scientific Review Committee. Dr. Thompson will coordinate the administration and management for the Project through SFEI.

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# APPLICATION FOR FEDERAL ASSISTANCE

OMB Approval No. 0548-0043

<b>1. TYPE OF SUBMISSION:</b> Application <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Non-Construction Preapplication <input type="checkbox"/> Construction <input type="checkbox"/> Non-Construction		<b>2. DATE SUBMITTED</b> April 16 1999	Applicant Identifier
		<b>3. DATE RECEIVED BY STATE</b>	State Application Identifier
		<b>4. DATE RECEIVED BY FEDERAL AGENCY</b>	Federal Identifier
<b>5. APPLICANT INFORMATION</b>			
Legal Name: San Francisco Estuary Institute		Organizational Unit:	
Address (give city, county, State, and zip code): 1325 S.46th Street Contra Costa County Richmond, CA 94804		Name and telephone number of person to be contacted on matters involving this application (give area code): MARGARET R. JOHNSTON 510 231-9539	
<b>6. EMPLOYER IDENTIFICATION NUMBER (EIN):</b> 94 - 2951373		<b>7. TYPE OF APPLICANT: (enter appropriate letter in box)</b> A. State B. County C. Municipal D. Township E. Interstate F. Intermunicipal G. Special District H. Independent School Dist. I. State Controlled Institution of Higher Learning J. Private University K. Indian Tribe L. Individual M. Profit Organization N. Other (Specify) <u>Non-Profit</u> <u>Research</u>	
<b>8. TYPE OF APPLICATION:</b> <input checked="" type="checkbox"/> New <input type="checkbox"/> Continuation <input type="checkbox"/> Revision If Revision, enter appropriate letter(s) in box(es) <input type="checkbox"/> <input type="checkbox"/> A. Increase Award B. Decrease Award C. Increase Duration D. Decrease Duration Other(specify):		<b>9. NAME OF FEDERAL AGENCY:</b>	
<b>10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER:</b> TITLE:		<b>11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:</b> Eval. of Contaminant Effects on Priority Fish Food Chain Resources in the Sac.-San Joaquin River and the Bay- Delta, Estuary & Dev. of Pesticide Monitoring Guidelines	
<b>12. AREAS AFFECTED BY PROJECT (Cities, Counties, States, etc.):</b>			
<b>13. PROPOSED PROJECT</b>		<b>14. CONGRESSIONAL DISTRICTS OF:</b>	
Start Date 10/99	Ending Date 9/02	a. Applicant 7TH	b. Project 7TH
<b>15. ESTIMATED FUNDING:</b>		<b>16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?</b>	
a. Federal:	\$ 2,495,770	a. YES. THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON: DATE	
b. Applicant	\$	b. No. <input type="checkbox"/> PROGRAM IS NOT COVERED BY E. O. 12372 <input type="checkbox"/> OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW	
c. State	\$		
d. Local	\$		
e. Other	\$		
f. Program Income	\$		
g. TOTAL	\$ 2,495,770	<b>17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT?</b> <input type="checkbox"/> Yes If "Yes," attach an explanation. <input checked="" type="checkbox"/> No	
<b>18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT, THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.</b>			
a. Type Name of Authorized Representative Margaret R. Johnston		b. Title Executive Director	c. Telephone Number 510 231-9539
d. Signature of Authorized Representative		e. Date Signed 4/16/99	

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Standard Form 424 (Rev. 7-97)  
Prescribed by OMB Circular A-102

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I-019090

**BUDGET INFORMATION - Non-Construction Programs****SECTION A - BUDGET SUMMARY**

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1.		\$	\$	\$ 2,495,770	\$	\$ 2,495,770
2.						
3.						
4.						
5. Totals		\$	\$	\$ 2,495,770	\$	\$ 2,495,770

**SECTION B - BUDGET CATEGORIES**

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY				Total
	(1)	(2)	(3)	(4)	(5)
a. Personnel	\$ 116,892	\$	\$	\$	\$ 116,892
b. Fringe Benefits	22,151				22,151
c. Travel					
d. Equipment					
e. Supplies					
f. Contractual	2,305,170				2,305,170
g. Construction					
h. Other					
i. Total Direct Charges (sum of 6a-6h)					
j. Indirect Charges	51,557				51,557
k. TOTALS (sum of 6i and 6j)	\$ 2,495,770	\$	\$	\$	\$ 2,495,770
7. Program Income	\$	\$	\$	\$	\$

SECTION C - NON-FEDERAL RESOURCES					
(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS	
8.	\$	\$	\$	\$	
9.					
10.					
11.					
12. TOTAL (sum of lines 8 - 11)	\$	\$	\$	\$	
SECTION D - FORECASTED CASH NEEDS					
Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	
13. Federal	\$ 457,120	\$ 73,564	\$ 103,897	\$ 139,831	\$ 139,831
14. Non-Federal					
15. TOTAL (sum of lines 13 and 14)	457,120	73,564	103,897	139,831	139,831
SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT					
(a) Grant Program	FUTURE FUNDING PERIODS (Years)				
	(b) First	(c) Second	(d) Third	(e) Fourth	
16.	\$ 457,120	\$ 1,412,152	\$ 626,498	\$	
17.					
18.					
19.					
20. TOTAL (sum of lines 16-19)	\$ 457,120	\$ 1,412,152	\$ 626,498	\$	
SECTION F - OTHER BUDGET INFORMATION					
21. Direct Charges:	2,444,213	22. Indirect Charges: 51,557			
23. Remarks:					

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Standard Form 424A (Rev. 4-92) Page 2

## NONDISCRIMINATION COMPLIANCE STATEMENT

STD. 19 (REV. 3-94) FMC

COMPANY NAME

SAN FRANCISCO ESTUARY INSTITUTE

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

## CERTIFICATION

*I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.*

OFFICIAL'S NAME

Margaret R. Johnston

DATE EXECUTED

4/16/99

EXECUTED IN THE COUNTY OF

Contra Costa County

PROSPECTIVE CONTRACTOR'S SIGNATURE

PROSPECTIVE CONTRACTOR'S TITLE

Executive Director

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

San Francisco Estuary Institute

# ASSURANCES - NON-CONSTRUCTION PROGRAMS

OMB Approval No. 0348-0040

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.

**PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.**

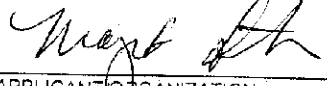
**NOTE:** Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.



9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.
10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 175(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).
12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL 		TITLE Executive Director	
APPLICANT ORGANIZATION San Francisco Estuary Institute		DATE SUBMITTED April 16, 1999	